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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/016,913	12/14/2001	Tetsuyuki Kurata	2418.44US01	9612
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PATTERSON, THUENTE, SKAAR & CHRISTENSEN, P.A. 4800 IDS CENTER 80 SOUTH 8TH STREET MINNEAPOLIS, MN 55402-2100			NGUYEN, SANG H	
			ART UNIT	PAPER NUMBER
			2877	

DATE MAILED: 12/13/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/016,913

Applicant(s)

KURATA ET AL.

Examiner

sang nguyen

Art Unit

2877

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 14 December 2001.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-29 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 26-29 is/are allowed.
- 6) ☒ Claim(s) 1,2,4,8-11,13-18,20-23 and 25 is/are rejected.
- 7) ☐ Claim(s) 3,5-7,12,19 and 24 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
- 1) ☒ Certified copies of the priority documents have been received.
 - 2) ☐ Certified copies of the priority documents have been received in Application No. _____.
 - 3) ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Priority

Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-2 and 14-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Choi (U.S. Patent No. 6,538,754) in view of Reytblatt (U.S. Patent No. 4,286,843).

Regarding claims 1 and 14-16; Choi teaches an apparatus and method for detecting a gap of a liquid crystal panel, comprising:

- A light emission apparatus, considered to be a light source (102 of figure 1), input polarizer (106 of figure 1), and a beam splitter (108 of figure 1), for causing a polarized light to fall almost parallel to the normal of the liquid crystal panel (114 of figure 1), wherein the polarizer (106 of figure 1) for rotating the direction of polarization of the incident light to respect to the liquid-crystal panel (114 of figure 1);
- An analyzer considered to be an output polarizer (110 of figure 1) for receiving the reflected light from the liquid crystal panel (114 of figure 1), wherein the analyzer (110 of figure 1) being arranged so that the transmission axis thereof is almost

Art Unit: 2877

perpendicular to the polarization direction of the incident light (figures 1-2 and col.2 lines 5-7); and

- A received light quantity detection device considered to be a silicon photodiode (112 of figure 1) for receiving the light the passed the analyzer (110 of figure 1) and detecting the gap of the liquid crystal panel
- A processing apparatus considered to inherent using first formula and second formula (col.2 lines 1-45) for analyzing detected the thickness of cell gap of the liquid crystal panel (114 of figure 1) from a received light quantity detection device based on a Twisted angle (ϕ of figure 2B) and Beta angle (β of figure 2B) at which the output signal of the received light quantity detection device (112 of figure 1) when the direction of incidence of incident light is rotated relative the transmission axis direction of the analyzer (110 of figure 1). See figures 1-3.

Choi discloses all of features of claimed invention except for the processing apparatus for detecting the gap of the liquid crystal panel based on an extinction angle at which the output signal of the received light quantity detection device reaches minimum when the direction of incidence of incident light is rotated relative the transmission axis direction of the analyzer. However, Reytblatt teaches that it is known in the art to provide a method and a plane-transmission polariscope (30 of figure 1 or 110 of figure 16) comprising a light source (32 of figure 16), polarizer (34 of figure 16), a sample (120 of figure 16), analyzer (44 of figure 16), and a camera (52 of figure 16), wherein a plane-transmission (30 of figure 1 or 110 of figure 16) for detecting the gap of the sample based on an extinction angle at which the output signal of the received light

Art Unit: 2877

quantity detection device considered to the camera (52 of figure 16) reaches minimum or zero when the direction of incidence of incident light is rotated relative the transmission axis direction of the analyzer (44 of figure 16 and col.6 lines 29-66 and col.10 lines 35-59).

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify apparatus and method for detecting a gap of a liquid crystal panel of Choi with the processing apparatus for detecting the gap of the liquid crystal panel based on an extinction angle at which the output signal of the received light quantity detection device reaches minimum when the direction of incidence of incident light is rotated relative the transmission axis direction of the analyzer as taught by Reytblatt for the purpose of reducing noise signal and detecting accuracy intensity light of image signals.

Regarding claim 2; Choi teaches about the direction of the polarization of the incident light of the polarizer (106 of figure 1) and the liquid crystal panel with rotate table (104 of figure 1) are rotated relative to each other by rotating the liquid crystal panel (114 of figure 1) about the axis almost parallel to the direction of incident of the incident light as a center (figure 2B).

Regarding claim 17; Choi teaches discloses all of features of claimed invention except for the received light quality detection use a surface-type imaging element. However, Reytblatt teaches that it is known in the art to provide the received light quality detection use a surface-type imaging element considered to be image camera (52 of figure 16). It would have been obvious to one having ordinary skill in the art at the time

Art Unit: 2877

the invention was made to modify apparatus and method for detecting a gap of a liquid crystal panel of Choi with the received light quality detection use a surface-type imaging element as taught by Reytblatt for the purpose of forming or detecting accuracy images of sample on the camera.

Regarding claim 18; Choi teaches about the light emission apparatus 102 of figure 1) and the received light quantity detection device (112 of figure 1) has a wavelength selection function considered to be inherent in formula (col.2 lines 15-35).

Claims 4, 8-11 and 19-23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Choi (U.S. Patent No. 6,538,754) in view of Ishiwata (U.S. Patent No. 6,369,375).

Regarding claims 4 and 19-20; Choi teaches an apparatus and method for detecting a gap of a liquid crystal panel, comprising:

- A light emission apparatus, considered to be a light source (102 of figure 1), input polarizer (106 of figure 1), and a beam splitter (108 of figure 1), for causing a polarized light to fall almost parallel to the normal of the liquid crystal panel (114 of figure 1), wherein the polarizer (106 of figure 1) for rotating the direction of polarization of the incident light to respect to the liquid-crystal panel (114 of figure 1);
- An analyzer considered to be an output polarizer (110 of figure 1) for receiving the reflected light from the liquid crystal panel (114 of figure 1), wherein the analyzer (110 of figure 1) being arranged so that the transmission axis thereof is almost perpendicular to the polarization direction of the incident light (figures 1-2 and col.2 lines 5-7); and

Art Unit: 2877

- A received light quantity detection device considered to be a silicon photodiode (112 of figure 1) for receiving the light the passed the analyzer (110 of figure 1) and detecting the gap of the liquid crystal panel based on relationship between beta angle (β) and thickness of the cell gap (114 of figure 1). See figures 1-3.

Choi discloses all of features of claimed invention except for a process apparatus is coupled to a first received light detection device and a second received light detection device, wherein the process apparatus for detecting the gap of the liquid crystal panel based on the first output signal from the first received light detection device in a state in which the analyzer is disposed so that the transmission axis of the analyzer is almost parallel to the polarization direction of the incident light and a second output signal from the second received light detection device in a state which the analyzer is disposed so that the transmission axis of the analyzer is almost perpendicular to the polarization direction of the incident light . However, Ishiwata teaches that it is known in the art to provide a method and detection apparatus comprises a processing computer (6 of figure 13) coupled to a first and second camera (5' of figure 13), wherein the process apparatus (6 of figure 13) for detecting the gap of the liquid crystal panel (15 of figure 13) based on the first output signal from the first received light detection device (5' of figure 13) in a state in which the analyzer (16 of figure 1) is disposed so that the transmission axis of the analyzer is almost parallel to the polarization direction of the incident light (figure 13) and a second output signal from the second received light detection device (5' of figure 1) in a state which the analyzer (16 of figure 1) is disposed

Art Unit: 2877

so that the transmission axis of the analyzer (16 of figure 1) is almost perpendicular to the polarization direction of the incident light. See figures 1, 7, and 13-14.

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify apparatus and method for detecting a gap of a liquid crystal panel of Choi with a process apparatus is coupled to a first received light detection device and a second received light detection device, wherein the process apparatus for detecting the gap of the liquid crystal panel based on the first output signal from the first received light detection device in a state in which the analyzer is disposed so that the transmission axis of the analyzer is almost parallel to the polarization direction of the incident light and a second output signal from the second received light detection device in a state which the analyzer is disposed so that the transmission axis of the analyzer is almost perpendicular to the polarization direction of the incident light as taught by Ishiwata for the purpose of detecting accuracy of physical amounts such distortion, edge of the step, and phase distribution of the observation object.

Regarding claims 8 and 23; Choi discloses all of features of claimed invention except for the first of the first received light detection device and second output of the second received light detection device for detecting at least two different rotation positions obtained based on the output signals detected in each rotation position. However, Ishiwata teaches that it is known in the art to provide the first of the first received light detection device (5' of figure 13) and second output of the second received light detection device (5' of figure 13) for detecting at least two different

Art Unit: 2877

rotation positions (figures 12A-12B) obtained based on the output signals detected in each rotation position. It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify apparatus and method for detecting a gap of a liquid crystal panel of Choi with the first of the first received light detection device and second output of the second received light detection device for detecting at least two different rotation positions obtained based on the output signals detected in each rotation position as taught by Ishiwata for the purpose of detecting accuracy of physical amounts such distortion, edge of the step, and phase distribution of the observation object (col.21 lines 34-36).

Regarding claim 9; Choi discloses the features of claimed invention except for the angle differ from no less than 5 degrees. However, Choi teaches about different between the twisted angle is 80 or 90 degree. It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the angle differ from no less than 5 degrees of Choi's device, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or working ranges involves only routine skill in the art. In re Aller, 105 USPQ 233.

Regarding claims 10 and 11; Choi discloses the features of claimed invention except for a half-mirror for directing reflecting the light from the light source toward the liquid crystal panel and transmitting reflected light from the liquid crystal panel and the first and second received light detection devices for detecting the gap cell based on the first and second output signals with predetermined noise light quality, quantity incident light, and transmissivity of the half mirror. However, Ishiwata teaches that it is known in

Art Unit: 2877

the art to provide a half-mirror (12 of figure 13) for directing reflecting the light from the light source (1 of figure 13) toward the liquid crystal panel (15 of figure 13) and transmitting reflected light from the liquid crystal panel (15 of figure 14) and the first and second received light detection devices (two 25' of figure 14) for detecting the gap cell based on the first and second output signals with predetermined noise light quality, quantity incident light, and transmissivity of the half mirror (col.21 lines 15-36). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify apparatus and method for detecting a gap of a liquid crystal panel of Choi with a half-mirror for directing reflecting the light from the light source toward the liquid crystal panel and transmitting reflected light from the liquid crystal panel and the first and second received light detection devices for detecting the gap cell based on the first and second output signals with predetermined noise light quality, quantity incident light, and transmissivity of the half mirror as taught by Ishiwata for the purpose of improving detected light signal and reducing noise signal.

Regarding claim 21; Choi teaches discloses all of features of claimed invention except for the received light quality detection use a surface-type imaging element. However, Ishiwata teaches that it is known in the art to provide the received light quality detection use a surface-type imaging element considered to be image camera (5' of figure 13). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify apparatus and method for detecting a gap of a liquid crystal panel of Choi with the received light quality detection use a surface-type imaging

Art Unit: 2877

element as taught by Ishiwata for the purpose of forming or detecting accuracy images of sample on the camera.

Regarding claim 22; Choi teaches about the light emission apparatus 102 of figure 1) and the received light quantity detection device (112 of figure 1) has a wavelength selection function considered to be inherent in formula (col.2 lines 15-35).

Regarding claims 13 and 25; Choi discloses all of features of claimed invention as indicated in claims 4 and 19, except for a polarization beam splitter disposed so as to receive the reflected light from the liquid crystal panel and separating a light having a polarization direction almost parallel to the polarization direction of the incident light and a light having a polarization direction almost perpendicular to the polarization direction of the incident light from the reflected light. However, Ishiwata teaches that it is known in the art to provide a method and detection apparatus comprises a processing computer (6 of figure 13) coupled to a first and second camera (5' of figure 13) and the first and second camera (5' of figure 13) coupled to a polarization beam splitter (PBS of figure 13), wherein the polarization beam splitter (PBS of figure 13) disposed so as to receive the reflected light from the liquid crystal panel (15 of figure 13) and separating a light having a polarization direction almost parallel to the polarization direction of the incident light and an another light having a polarization direction almost perpendicular to the polarization direction of the incident light from the reflected light. See figures 1, 7, and 13-14. Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify apparatus and method for detecting a gap of a liquid crystal panel of Choi with a polarization beam splitter disposed so as to receive

Art Unit: 2877

the reflected light from the liquid crystal panel and separating a light having a polarization direction almost parallel to the polarization direction of the incident light and a light having a polarization direction almost perpendicular to the polarization direction of the incident light from the reflected light as taught by Ishiwata for the purpose of detecting accuracy of physical amounts such distortion, edge of the step, and phase distribution of the observation object.

Allowable Subject Matter

Claims 26-29 are allowed.

The prior art of record, taken alone or in combination, fails discloses or render obvious apparatus for detecting a gap of a liquid crystal panel comprising all the specific elements with the specific combination including of third output signal from the received light quantity detection device in a state at which the analyzer is disposed so that the transmission axis of the analyzer is located on a bisector of the direction almost parallel to polarization direction of the incident light and the direction almost perpendicular thereto in combination with the rest of the limitation of claim 26.

Claims 3, 5-7, 12, 19, and 24 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The prior art of record, taken alone or in combination, fails discloses or render obvious a method and apparatus for detecting a gap of a liquid crystal panel comprising all the specific elements with the specific combination including of the gap d of the liquid crystal panel is detected by the following equations by using the detected extinction

Art Unit: 2877

angle : $\tan(2\phi_{app}) = \tan 2(\phi_{app} + \pi/2) = \phi[(\tan X)/X]$, where $X = \text{sqr}(\phi^2 + \beta^2)$, $\beta = (\pi\Delta n d)/\lambda$; $\Delta n = [(ne \cdot no)/\text{sqr}((no^2 + (ne^2 - no^2) \cdot \sin^2 \theta)] - no$ in set forth limitation of claim 3.

The prior art of record, taken alone or in combination, fails discloses or render obvious a method and apparatus for detecting a gap of a liquid crystal panel comprising all the specific elements with the specific combination including of the gap d of the liquid crystal panel is detected by the following equations by using the detected the first output signal Rx and the second output signal Ry: $R_x = \cos^2 \theta_{eff} + \cos^2(\theta_{app} + \theta) \sin^2 \theta_{eff}$; $R_y = \sin^2(\theta_{app} + \theta) \sin^2 \theta_{eff}$; $\cos \theta_{eff} = \cos^2 X + (\phi^2 - \beta^2) \cdot [\sin^2 X / X^2]$; $\cos 2\phi_{app} \cdot \sin \theta_{eff} = 2\beta[(\sin X \cdot \cos X)/X]$; $\sin 2\phi_{app} \cdot \sin \theta_{eff} = 2\phi\beta(\sin^2(X))/X^2$; $\theta_{eff} = (2\pi\Delta n_{eff} \cdot d)/\lambda$; $\tan(2\phi_{app}) = \tan 2(\phi_{app} + \pi/2) = \phi[(\tan X)/X]$, where $X = \text{sqr}(\phi^2 + \beta^2)$, $\beta = (\pi\Delta n d)/\lambda$; $\Delta n = [(ne \cdot no)/\text{sqr}((no^2 + (ne^2 - no^2) \cdot \sin^2 \theta)] - no$ in set forth limitation of claim 5.

The prior art of record, taken alone or in combination, fails discloses or render obvious a method and apparatus for detecting a gap of a liquid crystal panel comprising all the specific elements with the specific combination including of third received light quantity detection device for detecting a third output signal in a state in which the transmission axis of the analyzer is located on a bisector of the direction almost parallel to the polarization direction of the incident light and the direction almost perpendicular thereto, and in the step of detecting the gap of liquid crystal panel, the gap of the liquid crystal panel is detected based on the first, second, and third output signals in set forth limitation of claim 6.

Art Unit: 2877

The prior art of record, taken alone or in combination, fails discloses or render obvious a method and apparatus for detecting a gap of a liquid crystal panel comprising all the specific elements with the specific combination including of the gap d of the liquid crystal panel is detected by the following equations by using the detected the first output signal Rx and the second output signal Ry, and the third output signal Rxy: $R_{xy} = \frac{1}{2} [1 + \sin^2(\beta_{eff}) \cdot \sin^4(\phi_{app} + \alpha_{in})]$; $R_x = \cos^2\beta_{eff} + \cos^2(\alpha_{app} + \alpha_{in}) \sin^2\beta_{eff}$; $R_y = \sin^2(\alpha_{app} + \alpha_{in}) \sin^2\beta_{eff}$; $\cos\beta_{eff} = \cos^2X + (\phi^2 - \beta^2) \cdot [\sin^2X/X^2]$; $\cos 2\phi_{app} \cdot \sin\beta_{eff} = 2\beta[(\sin X \cdot \cos X)/X]$; $\sin 2\phi_{app} \cdot \sin\beta_{eff} = 2\phi\beta(\sin^2(X))/X^2$; $\beta_{eff} = (2\pi\Delta_{eff} \cdot d)/\lambda$; $\tan(2\phi_{app}) = \tan 2(\phi_{app} + \pi/2) = \phi[(\tan X)/X]$, where $X = \sqrt{\phi^2 + \beta^2}$, $\beta = (\pi\Delta n d)/\lambda$; $\Delta n = [(n_e \cdot n_o)/\sqrt{(n_o^2 + (n_e^2 - n_o^2) \cdot \sin^2\theta)}] - n_o$ in set forth limitation of claim 7

The prior art of record, taken alone or in combination, fails discloses or render obvious a method and apparatus for detecting a gap of a liquid crystal panel comprising all the specific elements with the specific combination including of the step of measuring a fourth signal representing the noise light quality and measuring a fifth output signal representing the noise light quality in set forth limitation of claims 12 and 24.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Kurata et al (6822737) discloses pretilt angle measuring method; Kuroiwa (6724215) discloses method of evaluating liquid crystal panel; Sokolov et al (6639674) discloses method and apparatus polarized; Kwok et al (6081337) discloses method and apparatus for measuring liquid crystal cell; Ooki et al (5764363) discloses apparatus for observing a surface; Fukuzawa et al (5638207) flare prevention optical

Art Unit: 2877

system; Katzir et al (5450201) discloses apparatus and method for optical inspection; Cole et al (5365067) discloses method and device for evaluation of surface; or Hopkins (5118191) discloses high contrast switchable target.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Sang Nguyen whose telephone number is (571) 272-2425. The examiner can normally be reached on 9:30 am to 7:00 pm.


If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Gregory J. Toatley, Jr. can be reached on (571) 272-2800 ext 77. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

SN

Nguyen/SN

December 1, 2004


Gregory J. Toatley, Jr.
Supervisory Patent Examiner
Art Unit 2877
9 Dec 04
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